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MACH V:
AN IMPROVED SCORING SYSTEM BASED ON A TRIADIC CHOICE MODEL

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Doubt was cast on the use made of social desirability matching in Christie and Geis's scoring system for Mach V and on the effectiveness of this matching for non-United States subjects. An alternative scoring system, based on a triadic choice decision model and not involving consideration of item matching, was proposed. The modified system was found to result in improved part–whole correlations and to yield scores which correlated .80 with those under the original scoring. Tentative norms for a United Kingdom student population were given for both scoring systems.

Machiavellianism (Christie & Geis, 1970) is unique among personality variables, in that it is derived neither from first principles nor from theoretical considerations but from one man's observations of human nature as it existed in Renaissance Florence. Despite (or perhaps because of) its origins outside of the mainstream of twentieth century psychological thought, Mach V has proved a very interesting variable in a number of social psychological paradigms.

This article is concerned with one particular aspect of Machiavellianism, namely scores and scoring on Mach V, and to understand our interest, it is necessary to look briefly at the history of Mach V. Essentially, it is a forced triadic choice version of Mach IV (which consisted of 20 statements which could be agreed on to varying degrees). Budner (1962) found there were suspiciously high negative correlations between Edwards' scale of Social Desirability and Mach IV. To deal with the problem of social desirability effects, Christie and Geis adopted a triadic choice format (based on Stewart, 1945), which is Machiavellian in its own right. Thus, Mach V consists of 20 triads, each triad consisting of one item which taps Machiavellianism (the keyed item), a second item matched in social desirability to the keyed item (the matched item), and a third item of different social desirability (the buffer). The subject faces the task of choosing the most acceptable item and the least acceptable item from each triad. Clearly, with such a format a person choosing on the basis of social desirability can neither achieve nor avoid a high Mach score. Also, faced with the keyed items and the matched items, the high Mach is likely to find the keyed item more acceptable while the reverse holds for the low Mach.

Christie and Geis's scoring procedure for Mach V is as follows:

Mach item	Matched item	Score
Most like	Least like	7
Most like	Omitted	5
Omitted	Least like	5
Omitted	Most like	3
Least like	Omitted	3
Least like	Most like	1

(And vice versa for negative Mach items)

Powerful methodological objections exist against this system. After carefully removing social desirability effects through the triadic choice format, Christie and Geis reintroduced them through the scoring system. They did this by arguing that "it is probably more Machiavellian to say the Mach. item is most like and the matched item least like oneself . . . than to say the Mach. item is most like and omit the matched item . . . [p. 30]." The effect of this in practice is that the subject's discrimination between two non-Mach items is taken into account in measuring his Machiavellianism. At best this introduces random error. Further, if for any reason (e.g., different populations) the social desirability matching was invalid, Christie and Geis's scoring dis-

[1] Thanks are due David Dalby for assistance in developing a computer program for our triadic choice model.

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TABLE 1

DISTRIBUTION OF ITEM FORMATS AND PART–WHOLE CORRELATIONS ON MACH V

Question	Format	Part–whole correlation
1	1	.11
2	1	.12
3	1	.14
4	1	.24
5	2	.27
6	2	.34
7	2	.33
8	2	.43
9	3	.29
10	1	.13
11	2	.27
12	2	.40
13	1	.08
14	4	.20
15	3	.20
16	2	.44
17	4	.36
18	3	.22
19	1	.19
20	1	.26

tinction in terms of the matched item would make no sense at all.

METHOD AND RESULTS

Our interest in the scoring of Mach V stemmed originally from the finding on a large sample (228) of British subjects[2] of an average Mach V score of 104.94, some 7.5 scale points above the value quoted by Christie and Geis (1970, p. 315) for United States college students. Although the obtained value might have been due to some genuine cross-cultural difference or to a lack of true comparability of samples,[3] our suspicions were aroused by the fact that the distribution of responses bore little resemblance to that which one would have expected had our subjects held views on social desirability similar to those of Christie and Geis's respondents.

TABLE 2

PART–WHOLE CORRELATION BY FORMAT

Format 1	Format 2	Format 3	Format 4
.11	.27	.29	.20
.12	.34	.20	.36
.14	.33	.22	
.24	.49		
.13	.27		
.08	.40		
.20	.44		
.26			
(.16)	(.38)	(.24)	(.29)

Note. Correlations in Formats 1 and 3 were significantly lower than those in Formats 2 and 4 by Mann-Whitney test, ($U = 7$, $p = .001$, one-tailed). Numbers in parentheses are the mean rs by z transformation.

The possibility that a breakdown in social desirability balancing and, hence, in effective scoring could be occurring with our subjects led us first to examine the part–whole correlations of the 20 triads on the assumption that items with low coefficients might be revealed. As Table 1 shows, a number of correlations were lower than might be desired. Further, as Table 2 shows, the magnitude of the correlations seemed linked to the format of the triad.[4] As can be seen, the tendency was for higher part–whole correlations to occur in Formats 2 and 4. These formats contain the items on which the trait loads negatively. One possible explanation of this could be that response distortions on unfavorably evaluated traits tended to occur on the more "transparent" positive trait-loading items.

In order to further explore the properties of the scale with a view to elucidating the meaning of the scores of our British subjects, we made use of a Gaussian transformation. That is, we treated the frequencies of item choice as if they reflected an underlying decision process of a kind analogous to that proposed by Swets, Tanner, and Birdsall (1961). In our

[2] The sample used in this study was approximately equivalent to an American college population in terms of age and education, and both sexes were represented. The data were obtained from a number of studies in which Machiavellianism was used as an independent variable.

[3] Data of Christie and Geis (1970) suggest that Mach levels vary markedly *within* populations. Scores tended, for example, to be higher in more elite schools. Also some student samples from major universities in the United States quoted in *Studies in Machiavellianism* had Mach scores well above our own value. (Thanks are due to the reviewer of an earlier draft of this article for bringing this point to our attention.)

[4] There are four possible formats (either a positive or a negative Mach item, with a third item that is either lower or higher in social desirability): (*a*) Format 1: the keyed item loads positively, the buffer is higher in desirability; (*b*) Format 2: the keyed item loads negatively, the buffer is lower in desirability; (*c*) Format 3: the keyed item loads positively, the buffer is lower in desirability; (*d*) Format 4: the keyed item loads negatively, the buffer is higher in desirability.

TABLE 3

RELATIONSHIP BETWEEN THE CHRISTIE AND GEIS AND THE EMPIRICAL MEANS OF SOCIAL DESIRABILITY

Triad	Mean social desirability (Christie & Geis, 1970)	Mean social desirability (empirical)	Format rationale predicts	Empirical finding	$\chi^2(df = 2)$	Prediction
1						
A	1.95	1.98	A = C	A > C	48*	False
B	3.60	1.39	B > C	B > C	14*	True
C(M)	1.95	1.06	A < B	A > B	30*	False
2						
A	2.85	.74	A = C	A < C	54*	False
B	3.70	2.25	B > C	B > C	63*	True
C(M)	2.85	1.48	A < B	A < B	196*	True
3						
A(M)	2.40	1.71	A = C	A > C	98*	False
B	3.70	2.08	B > C	B > C	110*	True
C	2.35	.58	A < B	A < B	18*	True
4						
A	2.80	1.22	A = B	A > B	22*	False
B(M)	2.80	.75	B < C	B < C	241*	True
C	4.35	2.52	A < C	A < C	193*	True
5						
A(−M)	3.60	1.89	A = B	A = B	2.4	True
B	3.50	1.98	B > C	B > C	199*	True
C	2.15	.32	A > C	A > C	168*	True
6						
A(−M)	2.90	.90	A = C	A < C	251*	False
B	1.80	1.14	B < C	B < C	252*	True
C	2.95	3.27	A > B	A < B	10*	False
7						
A	3.85	2.00	A = B	A = B	3.1	True
B(−M)	3.90	1.84	B > C	B > C	173*	True
C	2.30	.08	A > C	A > C	180*	True
8						
A	1.70	.31	B = C	B < C	25*	False
B	3.45	1.64	A < B	A < B	102*	True
C(−M)	3.45	2.13	A < C	A < C	161*	True
9						
A	2.10	1.17	B = C	B < C	84*	False
B(M)	2.90	1.14	A < B	A = B	3.0	False
C	2.75	2.14	A < C	A < C	71*	True
10						
A	2.15	.93	A = B	A < B	9*	False
B(M)	2.05	1.25	B < C	B < C	100*	True
C	3.80	2.38	A < C	A < C	145*	True
11						
A(−M)	3.85	1.79	A = B	A < B	33*	False
B	4.00	2.22	B > C	B > C	214*	True
C	2.25	−.09	A > C	A > C	231*	True
12						
A	2.15	1.33	B = C	B < C	41*	False
B	3.10	1.88	A < B	A > B	30*	True
C(−M)	3.15	1.20	A < C	A = C	3.0	False

TABLE 3 (*continued*)

Triad	Mean social desirability (Christie & Geis, 1970)	Mean social desirability (empirical)	Format rationale predicts	Empirical finding	$\chi^2(df = 2)$	Prediction
13						
A (M)	2.50	1.17	A = C	A < C	8*	False
B	4.00	3.16	A < B	A > B	189*	True
C	2.45	.96	B > C	B > C	237*	True
14						
A	4.05	2.64	B = C	B < C	10*	False
B (−M)	2.75	.93	A > B	A > B	165*	True
C	2.85	1.24	A > C	A > C	113*	True
15						
A	1.90	.40	B = C	B > C	53*	False
B (M)	3.05	2.28	A < B	A < B	228*	True
C	3.10	1.60	A < C	A < C	111*	True
16						
A	2.35	.51	B = C	B > C	38*	False
B	3.70	2.28	A < B	A < B	206*	True
C (−M)	3.65	1.64	A < C	A < C	113*	True
17						
A (−M)	2.55	.65	A = C	A < C	70*	False
B	4.00	2.18	B > C	B > C	68*	True
C	2.50	1.53	A < B	A < B	225*	True
18						
A (M)	3.55	1.85	A = C	A > C	49*	False
B	2.10	1.16	B < C	B = C	4.9	False
C	3.40	1.32	A > B	A > B	54*	True
19						
A	3.80	2.65	B = C	B < C	37*	False
B	2.25	.73	A > B	A > B	175*	True
C (M)	2.20	1.36	A > C	A > C	115*	True
20						
A	2.80	1.31	A = B	A = B	4.0	True
B (M)	2.75	1.24	B < C	B < C	32*	True
C	4.10	2.02	A < C	A < C	36*	True

Note. The M in parentheses indicates the Mach item, positively or negatively loaded.
* $p < .05$.

case, of course, not one but two decisions were involved (i.e., that between first choice and second choice and that between second choice and third choice). An imaginary case is given in Fig. 1. As can be seen, two criterion (decision) points existed, one for each decision, and equal probabilities lay in each of the three resulting segments.

From this process, it was possible using tables of the normal curve to calculate means and standard deviations that allow comparisons within a triad. This was done by assigning the arbitrary value of 1.0 as the distance between the two criterion points. Thus, for each item in a triad, a mean and standard deviation were derived.[5]

We next assumed that the dimension on which the choice of items was made was analogous to the social desirability used by Christie and Geis in designing Mach V; that is, for a population in which two items were "matched in social desirability," similar dis-

[5] This procedure is quite general and could be applied to any triadic choice situation in which both first and last choice are given.

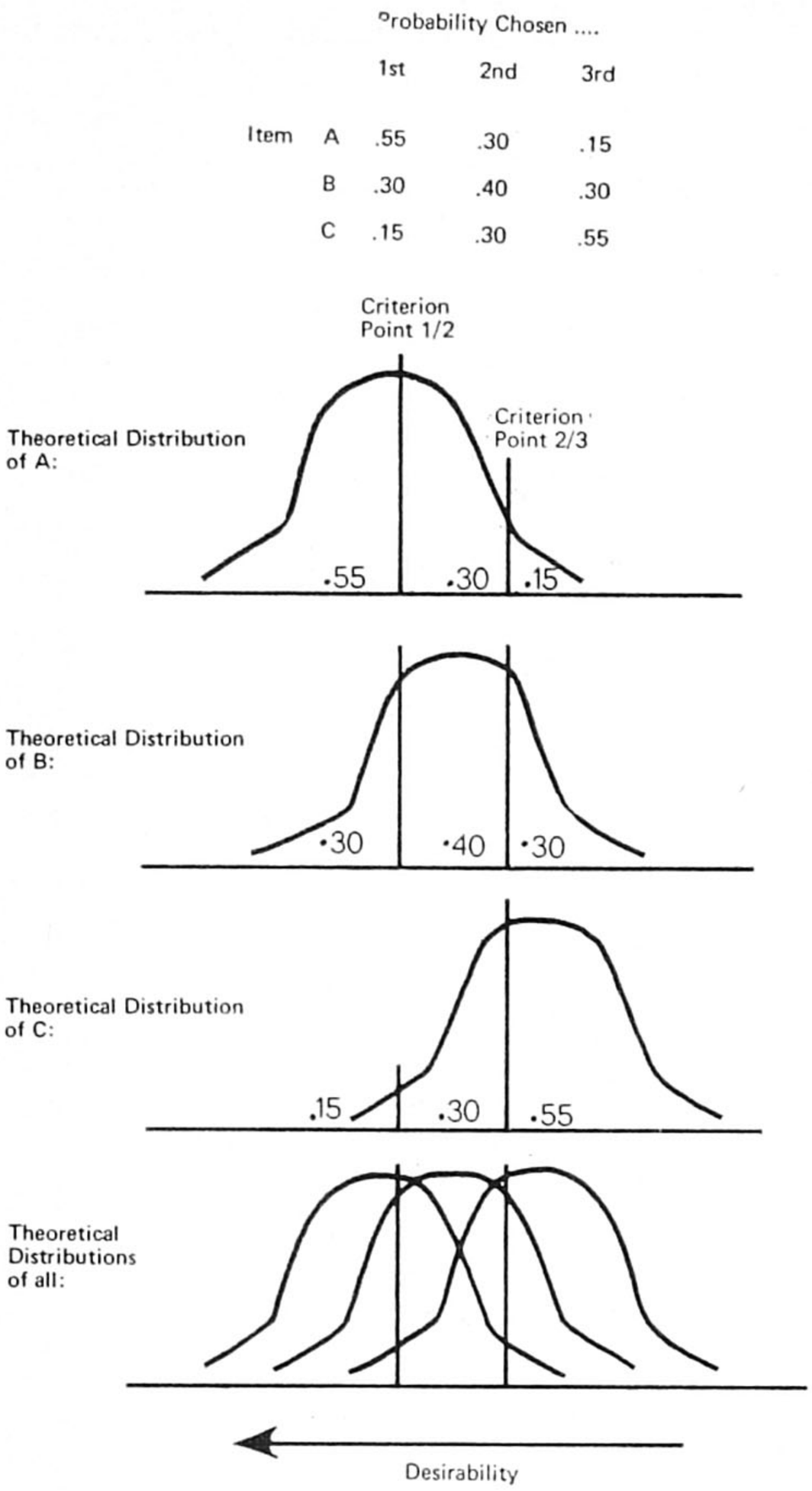

FIG. 1. Theoretical distribution of item choice.

tributions of choices should result[6] (i.e., although the Mach item in the pair would be more desirable to high Machs, it would be less so to low Machs, leading it to have equal desirability for the population). Systematic examinations were therefore made of the relationship between the social desirability means for each triad and the empirical means of desirability calculated as previously described.[7]

[6] Support for such an assumption can be found in the data of Edwards (1953), which show the correlation between one sample's rating of items for social desirability and another sample's level of endorsement to be .87.

[7] Since examination of the hypothetical variances gave no evidence of major differences of spread between items, the significance of differences between our calculated means was based on chi-square of the distribution of frequency of choices, as (unlike the hypothetical data) the degrees of freedom could be unambiguously determined.

These data are given in Table 3. As can be seen, only three of the triads gave perfect matches between Christie and Geis's desirability measure and our own. However, there is evidence that despite the wide variation, the predictions made on the basis of Christie and Geis's social desirability ratings were more often confirmed than refuted by our own findings. This can be shown by comparing the frequency of confirmation (predict $X > Y$ and find $X > Y$, or predict $X < Y$ and find $X < Y$) to the frequency of refutation (predict $X > Y$ and find $X \not> Y$, or predict $X < Y$ and find $X \not< Y$) which gives a chi-square of 21.0, significant at the .001 level on frequencies of 35 and 5, respectively. Our finding suggests that there is a positive relationship between desirability of the items for a North American population and for a British one. Since the disconfirmation of an equal prediction (i.e., the Mach item equals the matched item) could be influenced by the average Machiavellianism of our British sample, this was tested separately. Here we found a tendency (significant at the .05 level of chi-square) for the sign of the Mach item loading to be related to the direction of preference (15 cases where Mach positive items were preferred to their matches and matches were preferred to Mach negative items, against 5 cases where matches were preferred to Mach positive items and Mach negative items were preferred to their matches). This latter result follows from our triadic choice model, which assumes that the desirability of the Mach item relative to its match varies with the Machiavellianism of the chooser. In view of the wide breakdown in the matching assumptions previously discussed and taking into consideration our earlier objections to Christie's scoring systems, it was decided to develop an alternative scoring system which avoided taking differences between the non-Mach items within each triad into account. The simplest system (based on the idea, taken from our model, that the relative attractiveness of the Mach item varies systematically with the Machiavellianism of the subject) was

Mach item, first	7 points
Mach item, second	4 points
Mach item, third	1 point.

This scoring system was reversed for nega-

tive Mach items, and (as in Christie and Geis's system) a constant of 20 was added. The properties of the resultant scale were similar to those obtained under the original scoring system, that is, an expected mean of 100 and a range of 40–160.

The new scoring system was applied to our original data and gave a mean Mach of 98.79 with a standard deviation of 12.39, compared to a mean of 104.94 and a standard deviation of 10.16 under Christie and Geis's system. The two Machs correlated .801 (significant at the .001 level). The precision of the scale seemed to be increased by the new scoring system. This was suggested by the increase in standard deviation and confirmed by the increase in the part–whole correlation (Table 4).

In addition to illustrating the decision process for each item in Mach V for a total sample, the method of creating theoretical underlying curves can also be used to compare the responses of high, medium, and low Machs to the same item. This was achieved by defining the three groups (e.g., low = under 100, medium = 100–109, high = 110 and over) and running separate analyses for them. The absolute values of the resultant means for items were not strictly comparable between groups but the relative position of the means were. A "good" item was one in which the relative position of the Mach-loaded item increased (for a positive loading) in relative position as one moved from low Machs to high Machs. Figure 2 illustrates such comparisons both for triads with high and low part–whole correlations under Christie and Geis's scoring system and the modified scoring system.

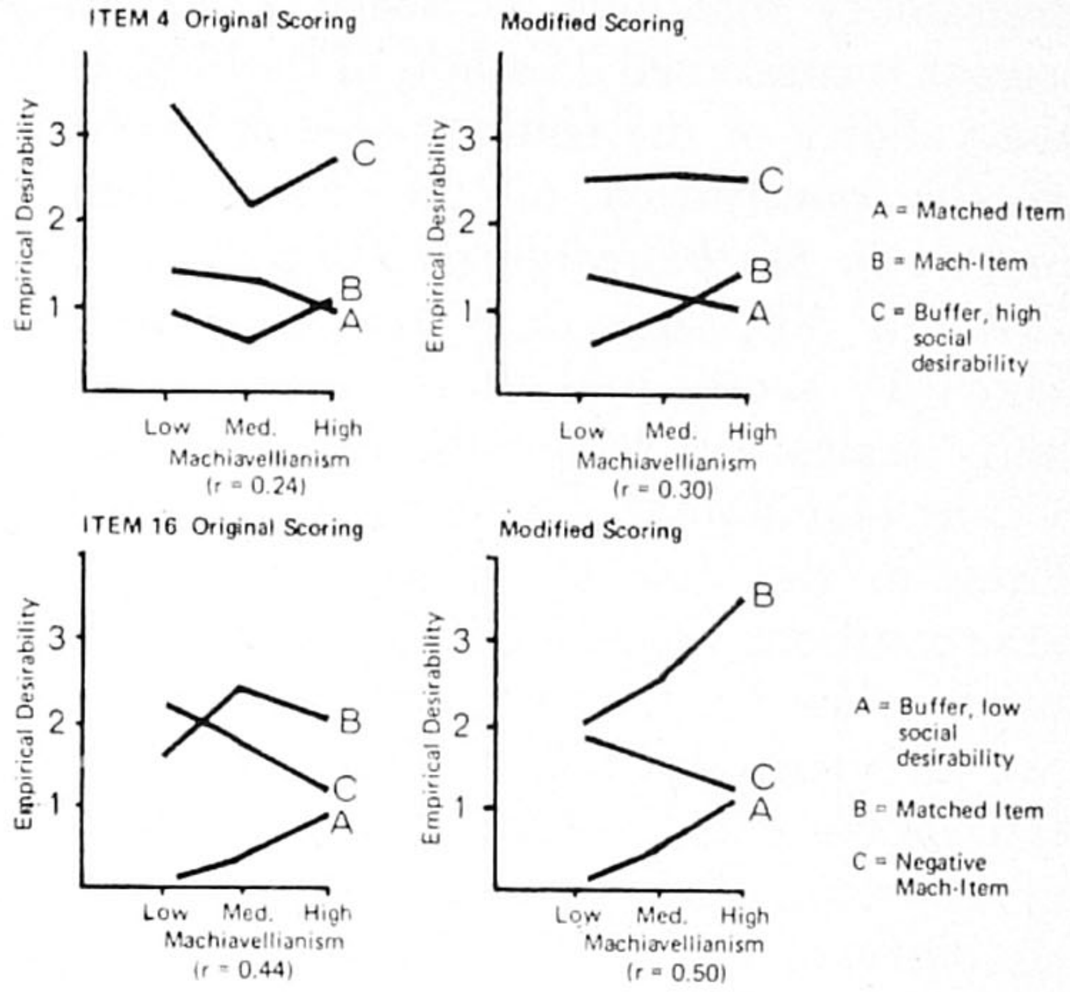

FIG. 2. Comparison between triads of the relative positions of the means under the original scoring system and the modified scoring system.

As can be seen, the new scoring system tended to give rise to more nearly linear trends across different levels of Machiavellianism. This effect was presumably the cause of the observed increase in part–whole correlations. Figure 2 also illustrates the way positive Mach items rose in relative desirability as Machiavellianism increased (Triad 4), while the reverse held for the negative Mach items (e.g., Triad 16).

TABLE 4

PART–WHOLE CORRELATIONS UNDER THE ORIGINAL AND THE MODIFIED SCORING SYSTEM

Item number	Part–whole correlation	
	Original	Modified
1	.11	.12
2	.12	.17
3	.14	.28
4	.24	.30
5	.27	.34
6	.34	.35
7	.33	.34
8	.43	.48
9	.29	.37
10	.13	.17
11	.27	.36
12	.40	.46
13	.08	.11
14	.20	.17
15	.20	.17
16	.44	.50
17	.36	.34
18	.22	.25
19	.19	.29
20	.26	.29

Note. Increased correlation occurs in 17 out of 20 cases; $\chi^2 = 8.45$, $p < .01$.

DISCUSSION

The data from our research lead us to the view that the alternative scoring system for Mach V outlined in this article represents both a theoretical improvement on Christie and Geis's scoring system, in that it removes from Mach scores any weighting due to the subject's response to the non-Mach items in a triad, and an empirical improvement as evidenced by the increased part–whole correlations and the plots of change in item choice by Mach level. This disregarding of the social

desirability matching in Mach V as far as *scoring* is concerned does not, of itself, question the validity of the concept of item matching in the *construction* of the scale. Data in *Studies in Machiavellianism* (Christie & Geis, 1970, p. 30), show how the correlation of Mach IV scores and those on social desirability scales that led to the creation of Mach V are eliminated on the latter instrument. Even in the case of subject pools or testing conditions where social desirability "press" is at a low level, there seems to be no reason to view Mach V as inappropriate—the forced-choice format having other justifications apart from those of the facility for social desirability matching. Our findings would also seem to have some implications for the validity of cross-cultural, and particularly cross-linguistic, "differences" in Machiavellianism, as it is more than likely that translation adds a further element of error into the already dubious extensibility of the matching within triads. In such studies, we would recommend the consideration of the new scoring system and the examination of item desirability either directly or by the method of underlying distributions. On the other hand, the authors recognize that there may be situations where favorable self-presentation is particularly salient, and the experimenter is concerned with the subjects' approach to choice between trait-tapping items and equally desirable non-trait-tapping items, when the original formulation of the scale may be the more appropriate treatment.

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